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UNITED STATES DEPARTMENT OF AGRICULTURE  
BUREAU OF AGRICULTURAL ECONOMICS

Operations Guidance Report on

WATER FACILITIES FOR

LEBOS AND GYPSUM CREEK WATERSHEDS

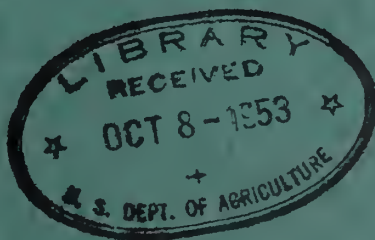
HARMON AND JACKSON COUNTIES

OKLAHOMA

Prepared by

WATER UTILIZATION SECTION  
DIVISION OF LAND ECONOMICS

September 1939



SEP 22 1939



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HARMON AND JACKSON COUNTIES  
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DIVISION OF LAND ECONOMICS

Under the Provisions of the  
Water Facilities Act  
(Public Law No. 399, 75th Congress)

September 1939



### ACKNOWLEDGEMENTS AND AUTHORIZATION

This report has been prepared by the Water Utilization Section, Land Economics Division, Bureau of Agricultural Economics. The base map of the area was compiled in part from original field reconnaissance, and in part from the base sheets of the Oklahoma State Highway Department. Geologic data were obtained from the geological map of Oklahoma, published by the United States Geological Survey, and Bulletin No. 40, Volume 2, published by the Oklahoma Geological Survey. Climatological data were obtained from the United States Weather Bureau. Pertinent information regarding land use and economic data was obtained from Harmon County officials.

This report has been prepared under the provisions of the Water Facilities Act, Public Law No. 399, of the 75th Congress. The Water Facilities Act authorized the Secretary of Agriculture to formulate a program for the development of small water facilities and further authorized the Secretary of Agriculture to assign responsibility for operation of the program.





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## CONCLUSIONS AND RECOMMENDATIONS

1. The average annual precipitation at Hollis, located in the area is 23.53 inches.
2. The estimated average annual surface run-off per square mile over the area is:
  - a. "Red bed" areas .....48 acre-feet
  - b. "Other" areas .....24 acre-feet
3. Surface water development is recommended as follows:
  - a. Construction of small ponds and reservoirs for stock watering purposes to alleviate summer shortage of water.
  - b. Flood irrigation of the better soil type native pastures.
4. It is recommended that ground-water development be limited to the following:
  - a. Development in Quaternary areas for both stock and domestic purposes.
  - b. Development in "red bed" areas for stock purposes only.



## PURPOSE AND SCOPE

The purpose of this report is to indicate, in a preliminary manner, the agricultural utilization of available water resources.

The data contained in this report are the result of reconnaissance studies. While additional information would allow recommendations to be made in greater detail, it is believed that the recommendations herein contained are reliable and have sufficient accuracy for the purpose of pointing the direction which the action program should take.

Proposed and recommended developments are outlined and discussed in their relation to the resource utilization of the area under consideration.



## DESCRIPTION OF AREA

Location.—The area discussed in this report is located in the southern half of Harmon County, Oklahoma, and in the southwestern quarter of Jackson County, Oklahoma. Harmon and Jackson Counties are located in the extreme southwestern part of the state. The area is drained by Lebos Creek (commonly called Sandy Creek) and Gypsum Creek (commonly called Boggy Creek). It lies between 34°20' and 34°50' north latitude and 99°15' and 100°00' west longitude. The size of the area is approximately 394 square miles or 252,160 acres.

The principal cities in the area are Hollis, Gould and Bethel in Harmon County, and Eldorado and Creta in Jackson County.

Topography.—The area as a whole, is an undulating plain with a general surface slope to the southwest. The topography varies from slightly rolling to undulating in the northern portion near the divide which separates this area from the watershed of the Salt Fork of Red River. The Gypsum Hills in the southeastern portion of the area with their eastward facing escarpments form the only noticeable relief in the area. They rise abruptly from the flat to rolling lands to a height of about 200 feet. Gypsum Creek passes directly





through the Gypsum Hills, which separate the higher, rolling country to the west, from the lower, predominately level country to the east. The land slopes to the southeast at an average rate of about twelve feet per mile.

Elevations.--Elevations vary in the area from approximately 1,650 feet in the extreme northwestern portion to about 1,400 feet at the confluence of Gypsum Creek with Red River.

Drainage Pattern.--Lebos and Gypsum Creeks, and their tributaries, make up practically the entire drainage pattern. Two or three very minor streams drain directly into the Red River between the confluences of Lebos and Gypsum with the Red River. The channel characteristics of Lebos Creek vary considerably from those of Gypsum Creek. Throughout the entire length of its course the channel of Lebos Creek is smooth and conforms to the natural slope of the adjacent lands, while Gypsum Creek has a narrow, deep channel through the region of the Gypsum Hills. Lebos Creek has a wide alluvial bottom.

Climatological Data.--The average monthly and annual precipitation at Hollis Oklahoma, is shown in the following table. This record is for a period of 16 years from 1923 to 1938, inclusive.

HOLLIS, OKLAHOMA  
AVERAGE MONTHLY AND ANNUAL PRECIPITATION IN INCHES  
ELEVATION - 1,610 FEET

<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Ann'l.</u>
.61	.67	1.32	2.65	3.52	2.59	1.79	2.17	3.17	3.08	.86	1.10	23.53



Geology and Ground-water Resources.—The surface formations

present over the area belong to the Permian and Quaternary systems.

Quaternary dune sands occur over an extensive area in the northwestern part of the area. These deposits are capable of yielding water of a satisfactory quality and in quantities of sufficient amount for both stock and domestic purposes. The average depth of existing wells producing water from these sands is about 30 feet. Additional wells can be developed from these deposits, however, it is recommended that no wells be located less than one-half a mile from the line of surface contact between these deposits and the Permian "red beds."

Quaternary alluvium deposits occur in the southern part of the area along Lebos Creek and the Salt Fork of Red River. These deposits will likewise produce water satisfactory in all respects for both stock and domestic purposes.

The remainder of the area is covered at the surface by formations comprising the "red bed" deposits. Of these, the Blaine Gypsum is the most widespread over the area. In the extreme southern part and along Gypsum Creek in the southeastern part of the area, erosion has removed the Blaine and exposed the underlying Chickasha-Duncan formation.

The "red beds" consist in general of alternating beds of red shales, clays, gypsum, and gypsiferous sands. They are poor aquifers and usually yield highly mineralized water, suitable only for stock purposes. Well depths in the "red bed" areas vary from 10 to 126 feet.



Surface Water.--The Army Engineers, in their report on the Red River, Louisiana, Arkansas, Oklahoma, and Texas, have divided the watershed of Red River into five main areas for the purpose of making an hydrological analysis. The following is a portion of the analysis:<sup>1</sup>

<u>Area</u>	<u>Trans- pira- tion</u>	<u>Deep Seep- age</u>	<u>Peak Disch. (CFS sq.mi.)</u>	<u>Low Water Flow (CFS sq.mi.)</u>	<u>Av. An'l. Run-off (Per cent)</u>	<u>Av. An'l. Run-off (Inches)</u>
Semi-arid Western Area		Very				
West Half: Low		Slight	...	.00	3	0.7
East Half: High		None	5	.00	5	1.3

It will be noted that the semi-arid western area has been divided into two areas, namely, the western half and the eastern half. The area treated by this report lies very near the center of the semi-arid western area, hence it is estimated that throughout the "red bed" areas in the Gypsum-Lebos watershed, the average annual run-off will approximate four per cent of the precipitation or 48 acre-feet per square mile.

Throughout the areas of Quaternary sands, the estimated average run-off is two per cent of the precipitation, or 24 acre-feet per square mile.

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<sup>1</sup> Red River, Louisiana, Arkansas, Oklahoma, and Texas; Corps of Engineers, House Document No. 378, 74th Congress, 2nd session, Volume 2, Table 1, p. 139.



Land Use.—It is estimated that approximately 30 per cent of the land is in native pasture and the remainder tilled. The acreage of abandoned land in either class is negligible although numerous abandoned houses dot the area.

Cash crop farming is the prevalent type in the area with wheat and cotton the dominant crops. Production of livestock and grain sorghums are supplemental enterprises. Seed crops are also grown on a small scale. Approximately 50 per cent of the farm operators are tenants.







### PROPOSED AREA UTILIZATION

It is recommended that surface water developments be limited to (1) the construction of small dams and reservoirs for stock watering purposes, and (2) to flood irrigation of the better soil type native pastures. Care should be exercised in the selection of dam sites because of the presence of the cavernous and gypsiferous Blaine formation, which lies at or near the surface over much of the area.

It is recommended that ground-water development for combined stock and domestic purposes be limited to the areas of Quaternary deposits. Throughout the "red bed" areas, ground-water development is recommended for stock purposes only.









# LEBOS AND GYPSUM CREEK WATERSHEDS GEOLOGY AND AVAILABILITY OF GROUND WATER

Prepared By  
WATER UTILIZATION SECTION  
DIVISION OF LAND ECONOMICS

Under The Provisions of  
The Water Facilities Act, Public  
Law No 399 75th Congress  
JUNE 1939

Sedimentary Rocks		Availability of Ground Water
Quaternary	Qt Sand Dune	Potable groundwater readily recoverable in quantities sufficient for stock and domestic purposes
	Qal Alluvium	
Permian	Cb Blaine Gypsum	Groundwater generally available in quantities for stock water purposes. Unfit for domestic purposes.
	Ccd Chichasha form. & Duncan sandstone	

